TETRA TECH

August 22, 2014

Ms. Susan Fisher
On-scene Coordinator
U.S. Environmental Protection Agency - TLC
8600 NE Underground Drive, Pillar 253
Kansas City, Missouri 64161

Subject: **Quality Assurance Project Plan, Removal Assessment**
Atlantic Water Supply Site, Atlantic, Iowa
CERCLIS ID No. IAD039954300
U.S. EPA Region 7 START 4, Contract No. EP-S7-13-06, Task Order No. 0030
Task Monitor: Susan Fisher, On-scene Coordinator

Dear Ms. Fisher:

Tetra Tech Inc. is submitting the attached Quality Assurance Project Plan for Removal Assessment activities at the Atlantic Water Supply site in Atlantic, Cass County, Iowa. If you have any questions or comments, please contact David Zimmermann at (816) 412-1788.

Sincerely,

David Zimmermann, CHMM
START Project Manager

Ted Faile, PG, CHMM
START Program Manager

Enclosures

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QUALITY ASSURANCE PROJECT PLAN
FOR A REMOVAL ASSESSMENT
ATLANTIC WATER SUPPLY SITE
ATLANTIC, IOWA

CERCLIS ID: IAD039954300

Superfund Technical Assessment and Response Team (START) 4 Contract
Contract No. EP-S7-13-06, Task Order 0030

Prepared For:

U.S. Environmental Protection Agency
Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

August 22, 2014

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☐ Search Sampling ☐ Systematic Grid ☐ Systematic Random Sampling ☒ Definitive Sampling
☐ Screening w/o Definitive Confirmation ☐ Screening w/ Definitive Confirmation
☒ Sample Map Attached

☒ Other (Provide rationale behind each sample): See Appendix A for additional sampling information.

The proposed sampling scheme will be biased/judgmental with definitive laboratory analysis, in accordance with the *Guidance for Performing Site Inspections Under CERCLA*, Office of Solid Waste and Emergency Response (OSWER) Directive #9345.1-05, September 1992, and *Removal Program Representative Sampling Guidance, Volume 1: Soil*, OSWER Directive 9360.4-10, November 1991. Judgmental sampling is the subjective (based) selection of sampling locations based on historical information, visual inspection, and the best professional judgment of the sampler(s). See Appendices A and B for additional site-specific information and maps.

The proposed number of samples was determined by the EPA Project Manager, and represents a reasonable attempt to meet the study objectives while staying within the budget constraints of the project.

Sample Summary Location	Matrix	# of Samples*	Analysis
Groundwater – Monitoring Wells	Groundwater	6	VOCs
Dakota Sandstone	Solid	6	Total Organic Carbon

*NOTE: Quality control (QC) samples are not included with these totals. See Table 1 for a complete sample summary.

2.2 Sample Methods Requirements:

Matrix	Sampling Method	EPA SOP(s) or other Method
Water – Monitoring Wells	Three existing and three newly installed monitoring wells will be sampled by use of a bailer.	SOP 4231.2007
Soil	Samples of Dakota Sandstone will be collected from split barrel samplers during construction of new wells.	SOP 4231.2012

☐ Other Description:

2.3 Sample Handling and Custody Requirements:

☒ Samples will be packaged and preserved in accordance with procedures defined in Region 7 EPA SOP 2420.06.
☒ COC will be maintained as directed by Region 7 EPA SOP 2420.04.
☒ Samples will be accepted according to Region 7 EPA SOP 2420.01.
☐ Other (Describe): Samples submitted to a START-contracted laboratory will be accepted in accordance with procedures established by the laboratory.

2.4 Analytical Methods Requirements:

☒ Identified in attached table.
☒ Rationale: The requested analyses have been selected based on historical information about the site and program experience with similar types of sites.
☐ Other (Describe):

2.5 Quality Control Requirements:

☐ Not Applicable
☒ Identified in attached table.
☒ In accordance with the Generic Quality Assurance Project Plan for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☒ Field QC Samples: For this investigation, field QC samples will include one field blank (water) prepared with deionized (DI) water provided by the EPA Region 7 laboratory. The field blank will be collected to evaluate potential contamination of sampling containers and/or preservatives, and to assess contamination potentially introduced during the sampling and laboratory procedure(s). One water trip blank will be prepared by the EPA Region 7 laboratory and be used to evaluate contamination introduced during transportation of the containers/samples. All QC samples will be submitted for the analyses listed in the attached tables. Evaluation of whether the environmental samples are representative depends on a comparison of levels of contamination found in blank samples with levels of contamination found in environmental samples. Analytical results from blank samples will be evaluated on a qualitative basis by the EPA Project Manager and EPA contractor(s) to determine a general indication of field-introduced and/or lab-introduced contamination. Because evaluation of total method precision is not necessary for this project, no field duplicates will be collected.
☐ Other (Describe):

2.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements:

☐ Not Applicable
☒ In accordance with the Generic Quality Assurance Project Plan for the Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☒ Testing, inspection, and maintenance of analytical instrumentation will accord with the previously referenced SOPs and/or manufacturers' recommendations. Testing, inspection, and maintenance of field instruments (water quality meter, Global Positioning System [GPS] unit, etc.) will accord with manufacturers' recommendations.

2.7 Instrument Calibration and Frequency:

☐ Not Applicable
☒ In accordance with the Generic Quality Assurance Project Plan for the Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☒ Calibration of laboratory equipment will proceed as described in the previously referenced SOPs and/or manufacturers' recommendations.
☒ Other (Describe): Calibration of field instruments (water quality meter, etc.) will accord with manufacturers' recommendations.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables:

☐ Not Applicable
☒ In accordance with the Generic Quality Assurance Project Plan for the Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☒ All sample containers will meet EPA criteria for cleaning procedures for low-level chemical analysis. Sample containers will have Level II certifications provided by the manufacturer in accordance with pre-cleaning criteria established by EPA in *Specifications and Guidelines for Obtaining Contaminant-Free Containers.*
☐ Other (Describe):

2.9 Data Acquisition Requirements:

☐ Not Applicable
☒ In accordance with the Generic Quality Assurance Project Plan for the Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☒ Previous data or information pertaining to the area (including other analytical data, reports, photos, maps, etc., that are referenced in this QAPP) has been compiled by EPA and/or its contractor(s) from other sources. Some of that data has not been verified by EPA and/or its contractor(s); however, that unverified information will not be used for decision-making purposes by EPA without verification by an independent professional qualified to verify such data or information.
☐ Other (Describe):

2.10 Data Management:

☒ All laboratory data acquired will be managed in accordance with Region 7 EPA SOP 2410.01.
☐ Other (Describe): Management of laboratory data acquired by the START-contracted laboratory will accord with procedures established by the laboratory.

3.0 Assessment and Oversight:

3.1 Assessment and Response Actions:

☒ Peer Review ☒ Management Review ☐ Field Audit ☐ Lab Audit
☒ Assessment and response actions pertaining to analytical phases of the project are addressed in Region 7 EPA SOPs 2430.06 and 2430.12.
☐ Other (Describe): Assessment and response actions pertaining to analytical phases of the project will accord with procedures established by the START-contracted laboratory (to be determined).

3.1A Corrective Action:

☒ Corrective actions will be at the discretion of the EPA Project Manager whenever problems appear that could adversely affect data quality and/or resulting decisions affecting future response actions pertaining to the area.
☐ Other (Describe):

3.2 Reports to Management:

☐ Audit Report ☐ Data Validation Report ☐ Project Status Report ☐ None Required

☒ A letter report describing the sampling techniques, locations, problems encountered (with resolutions to those problems), and interpretation of analytical results will be prepared by START and submitted to the EPA.
☒ Reports will be prepared in accordance with the Generic Quality Assurance Project Plan for the Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☐ Other (Describe):

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4.0 Data Validation and Usability:

4.1 Data Review, Validation, and Verification Requirements:

- ☐ Identified in attached table.
- ☒ Data review and verification will accord with the Generic Quality Assurance Project Plan for the Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
- ☒ Data review and verification will be performed by a qualified analyst and the laboratory's section manager as described in Region 7 EPA SOPs 2430.06, 2430.12, and 2410.10.
- ☐ Other (Describe):

4.2 Validation and Verification Methods:

- ☐ Identified in attached table.
- ☒ The data will be validated in accordance with Region 7 EPA SOPs 2430.06, 2430.12, and 2410.10.
- ☒ The EPA Project Manager will inspect the data to provide a final review. The EPA Project Manager will review the data, if applicable, for laboratory spikes and duplicates, laboratory blanks, and field QC samples to ensure the data are acceptable. The EPA Project Manager will also compare the sample descriptions with the field sheets for consistency, and will ensure appropriate documentation of any anomalies in the data.
- ☐ Other (Describe):

4.3 Reconciliation with User Requirements:

- ☒ If data quality indicators do not meet the project's requirements as outlined in this QAPP, the data may be discarded, and re-sampling or re-analysis of the subject samples may be required by the EPA Project Manager.
- ☐ Other (Describe):

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Table 1: Sample Summary

Site Name: Atlantic Water Supply Site | **Location:** Atlantic, IA; see Appendix B, Figure 1

START Project Manager: David Zimmermann | **Activity/ASR #:** To be determined | **Date:** August 2014

No. of Samples	Matrix	Location	Purpose	Depth or other Descriptor	Requested Analysis	Sampling Method	Analytical Method/SOP
6	Water	Three existing monitoring wells and three newly installed monitoring wells	To assess the level of tetrachloroethene (PCE) contamination in the Dakota Sandstone between the source and well field	Existing wells are screened from about 35 to 45 feet below ground surface (bgs). New wells will be screening at about 60 to 70 feet bgs.	VOCs	EPA SOP 4231.2007	EPA SOP 3230.13
6	Soil	Two samples will be collected from each boring	Samples from the Dakota Sandstone will be collected to refine groundwater fate and transport modeling	Collection of two samples from the Dakota Sandstone at each boring is anticipated. Presence of the sandstone is expected at 30 feet bgs.	Total Organic Carbon	EPA SOP 4231.2012	EPA SOP 3151.2
QC Samples							
1	Water	Field blank	To assess field- and transportation-related contamination	NA	VOCs	NA	EPA SOP 3230.13
1	Water	Trip blank	To assess field/transportation-related contamination	N/A	VOCs	N/A	EPA SOP 3230.13

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Table 2: Data Quality Objective Summary

Site Name: Atlantic Water Supply Site | **Location:** Atlantic, IA; see Appendix B, Figure 1

START Project Manager: David Zimmermann | **Activity/ASR #:** To be determined | **Date:** August 2014

Analysis	Analytical Method	Data Quality Measurements					Sample Handling Procedures	Data Management Procedures
		Accuracy	Precision	Representativeness	Completeness	Comparability		
Groundwater								
VOCs	See Table 1	Per analytical method	Per analytical method	Judgmental sampling based on professional judgment of the sampling team	100%; no critical samples have been identified	Standardized procedures for sample collection and analysis will be used.	See Section 2.3 of QAPP form.	See Section 2.10 of QAPP form.
TOC	See Table 1	Per analytical method	Per analytical method	Judgmental sampling based on professional judgment of the sampling team	100%; no critical samples have been identified	Standardized procedures for sample collection and analysis will be used.	See Section 2.3 of QAPP form.	See Section 2.10 of QAPP form.

APPENDIX A

SITE-SPECIFIC INFORMATION REGARDING A REMOVAL ASSESSMENT AT THE ATLANTIC WATER SUPPLY SITE

INTRODUCTION

The Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) has been tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Superfund Division to conduct Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal assessment activities at the Atlantic Water Supply site in Atlantic, Cass County, Iowa. The site includes a tetrachloroethene (PCE) groundwater contamination plume that appears to be originating from an abandoned dry cleaners and has impacted a number of municipal wells about 0.5 mile northwest. The site was initially investigated by EPA's pre-remedial program in the late 1980s. Since that time, the site has undergone a number of followup investigations, including a removal assessment in the mid-1990s that involved identification of the source of contamination through installation of 13 Geoprobe® soil borings, and installation and sampling of three permanent monitoring wells. In 2005, a hydrogeologic investigation evaluated the feasibility of installing a permeable reactive barrier wall. During this investigation, six deep borings were advanced by use of a drill rig to develop a vertical profile of groundwater contamination in the Cretaceous-age Dakota Sandstone bedrock aquifer near the City's well field. In 2011, a site reassessment determined current groundwater concentrations and reevaluated the site by use of the Hazard Ranking System. In 2012 and 2013, a removal reassessment investigation was completed in which a source was delineated, groundwater samples were collected by use of Geoprobe® temporary wells, municipal wells and piezometers were sampled, and sub-slab vapor and indoor air samples were collected. Following this investigation, groundwater modeling was conducted in August 2013 to predict plume concentration and movement in the future (Battelle 2013).

As specified by the START task order and subsequent conversations with the EPA Region 7 On-scene Coordinator, this activity will involve installation of three monitoring wells that will be screened in the Dakota Sandstone to help refine and validate the groundwater flow and transport model, and to serve as monitoring points to evaluate effectiveness of any future removal action or remedial activities. This Quality Assurance Project Plan (QAPP) identifies site-specific features and addresses elements of the sampling strategy and analytical methods proposed for this investigation.

SITE LOCATION/DESCRIPTION

Atlantic is a rural community in the northeastern portion of Cass County, Iowa, about 75 miles west of Des Moines, Iowa, and 45 miles northeast of Council Bluffs, Iowa. The apparent source of contamination at the Atlantic Water Supply site is at 1205 East 7th Street, also known as U.S. Highway 6 or State Highway 83 (see Appendix B, Figure 1). A former dry cleaning facility, the Norge Dry Cleaning Village,

operated at this location during the 1960s. Approximate coordinates of the former dry cleaner are latitude 41.403718° north and longitude 94.995763° west. Though exact dates of operation are not known, the dry cleaning facility was listed in the 1962 Atlantic City Directory (Atlantic, Iowa 1962). This facility also was used from 1960 to 1974 by Shrauger Appliance as an appliance retailing facility. In 1974, the Iowa Department of Transportation (IDOT) leased the site as a materials testing laboratory. IDOT relocated its operation in March 1986 to a site east of the City. It is suspected that the dry cleaning operations and IDOT routinely used solvents (Ecology & Environment, Inc. [E&E] 1988).

Based on historical aerial photographs of the site (Historical Information Gatherers [HIG] 2003), the building that housed the former dry cleaner/IDOT laboratory facility was razed between 1982 and 1994. The property is now owned by the Rolling Hills Bank and Trust. Land use surrounding the site is a mix of commercial and residential properties. The City of Atlantic's municipal well field is approximately 0.50 mile northwest of the former dry cleaner location.

The municipal water supply well field in Atlantic, Iowa, has been impacted by tetrachloroethene (PCE, also known as perchloroethylene) (Tetra Tech EM Inc. 2004). At the source, approximately 40 feet of silt and clay overlies fine- to coarse-grained friable sandstone from which the well field withdraws the City's potable water supply. The silt and clay soils have been contaminated with PCE that has migrated to the underlying Dakota Sandstone aquifer used by the City of Atlantic for its municipal water supply.

The PCE contamination continues to migrate downward into the sandstone aquifer, and then to travel horizontally within this aquifer to the City's municipal well field. The well nearest to the source area (AMU Well No. 7) was first found to contain PCE in 1982 (reported at a concentration of 170 micrograms per liter [µg/L]) (E&E 1988). AMU Well No. 7 was disconnected from the system and is now pumped continually by the local water authority wastewater treatment plant in order to provide hydraulic control and protect nine other municipal wells from contamination. Currently, nine active municipal wells serve the 7,200 citizens of Atlantic, Iowa. Eight municipal wells (AMU Well Nos. 10 through 17) are on the north side of Troublesome Creek between 0.5 and 1 mile from the former dry cleaner site (Figure 2, Appendix B). AMU Well Nos. 6 and 7 are on the south side of the creek. Total depths of the nine active municipal wells range from approximately 75 to 98 feet below ground surface (bgs), with an average of 87 feet bgs. Other wells previously present on the south side of the creek (AMU Well Nos. 1 through 5 and 8 and 9) have since been decommissioned due to their age and diminishing performance. AMU well No. 6, approximately 910 feet northeast of AMU well No. 7, is also slightly contaminated with PCE (approximately 5 micrograms per liter [µg/L] or less), which signifies the overall width of the PCE contaminant plume. AMU well No. 6 is still used as a drinking water well and

is pumped approximately 15 to 20 hours per day at 300 to 350 gallons per minute (gpm) on average. Water from the nine active municipal wells is initially blended and then treated. Prior to distribution, the water is treated primarily with liquid chlorine, used to disinfect the water, and fluorosilicic acid (H_2SiF_6), for water fluoridation. Hydrochloric acid is additionally used for well maintenance and rehabilitation for removal of mineral scale.

PREVIOUS INVESTIGATIONS

During a water quality survey by the Iowa Department of Natural Resources (IDNR) in August 1982, PCE was detected in AMU Well No. 7 (AMU-7) at a concentration of 170 µg/L. Subsequent IDNR sampling events detected PCE in AMU-7 at concentrations ranging from 11 µg/L in March 1995 (IDNR 1999) to 260 µg/L in August 1984 (E&E 1988). The maximum contaminant level (MCL) for PCE is 5 µg/L. From August 1982 to November 1987, water from AMU-7 was pumped at a rate of 80 gpm to Buttermilk Creek in an attempt to prevent migration of the PCE contamination to other nearby drinking water supply wells (E&E 1988). In December 1987, the discharge from AMU-7 was rerouted to the 3rd Street sanitary sewer line about 150 feet southwest of the well for treatment at the City of Atlantic's wastewater treatment facility (E&E 1988).

In August 1987, an EPA contractor conducted a soil gas survey to delineate the approximate extent of PCE contamination. Soil gas samples were collected from a depth of 5 to 6 feet bgs at 55 locations, beginning at the former dry cleaners and IDOT laboratory facility, and proceeding in the direction of groundwater flow (north-northwest) toward the AMU well field. Analytical results suggested the source area was just south of East 7th Street, about 250 feet east of the former dry cleaning and IDOT laboratory facility (E&E 1988). The report stated that a release of PCE likely had occurred at the former dry cleaning and IDOT laboratory facility, and had migrated via surface runoff and groundwater flow to this topographic low. According to the report, the migration of PCE from the source area may have followed the storm sewer system along the southern side of East 7th Street (E&E 1988).

In August and November 1998, IDNR conducted followup investigations of the PCE contamination to better define the source. During these investigations, 34 soil gas samples and 10 soil samples were collected for analysis. IDNR analyzed the soil samples for PCE utilizing a mobile laboratory and using a headspace analysis method. The sampling focused on the area of the former dry cleaning and IDOT laboratory facility, and the source area identified during the 1987 EPA investigation. Soil gas data from the IDNR investigations confirmed the level of PCE contamination originally detected near the former Hardee's restaurant. However, significantly higher PCE levels (greater than 10,000 parts per million)

were detected near the former dry cleaning and IDOT laboratory facility. Based on these findings, IDNR concluded that contamination in the silty, clayey soil beneath the former dry cleaning and IDOT laboratory facility is the predominant source of PCE impacting the groundwater (IDNR 1999). The report indicated that soils appeared to be contaminated to a depth of at least 20 feet bgs. The report also recommended installing monitoring wells to better define the extent of PCE contamination in groundwater near the suspected source area.

From 2002 through 2004, Tetra Tech START conducted a removal site evaluation (RSE) of the Atlantic Water Supply site. Field activities included advancement of 13 soil borings to depths ranging from 23 to 36 feet bgs (Tetra Tech EM Inc.2004). These borings were advanced around the previously identified source area and sampled to aid in determining the extent of contamination. In addition, three permanent, flush-mounted monitoring wells (MW) were installed into the Dakota Sandstone at depths ranging from 40.5 to 50 feet bgs. These wells were installed to assess groundwater quality near the source area. All three wells have 15-foot screens that extend about 10 feet into the Dakota Sandstone. In soils, PCE was reported at its highest concentrations near MW-2, installed near the former dry cleaner. At this location, PCE was found at concentration above the preliminary remediation goal (PRG) of 3,400 micrograms per kilogram (µg/kg) in samples collected from 19 to 36 feet bgs. This was the only soil boring with PCE levels above the PRG. Of the three monitoring wells installed, MW-2 was the only one containing PCE in groundwater at concentrations greater than 1 µg/L. PCE was reported at a maximum concentration of 5,300 µg/L in this well in July 2003 (Tetra Tech EM Inc. 2004).

In 2005, personnel from the EPA Environmental Response Team (ERT) and the Response Engineering and Analytical Contract (REAC) conducted a hydrogeologic investigation at the site (Lockheed Martin Technology Services 2005). The primary purpose of the investigation was to define the nature and extent of groundwater contamination upgradient of the municipal well field in order to assess the applicability of installing a permeable reactive barrier (PRB) for groundwater treatment and protection. As part of the investigation, six boreholes were installed about 150 feet upgradient (south) of contaminated AMU Well No. 7 at the approximate centerline of the proposed PRB wall. Borehole depths ranged from 76 to 87.5 feet bgs, and were installed into the upper sandstone bedrock by use of sonic drilling techniques. Multiple groundwater samples were collected at each boring, beginning at about 20 to 25 feet bgs, and then at 20-foot intervals as the borings were advanced. In all, 28 groundwater samples were collected. PCE was reported in water samples from all six borings, with the highest concentration (446 µg/L) found in the boring farthest east (Lockheed Martin Technology Services 2005). The eastern extent of the plume near the well field was not delineated in that investigation, and remains undefined. Following the

investigation, preliminary cost estimates to install a PRB were calculated. The total costs for this remedial technology were prohibitive to implement under the removal program.

In December 2011, as part of a site reassessment, START collected groundwater samples from three monitoring wells near the source (Tetra Tech EM Inc. 2012). Groundwater samples were also collected from nine active municipal wells and a former municipal well (AMU-7) that is now pumped to waste to contain the plume. PCE (2,500 µg/L) and *cis*-1,2-dichloroethene (3.8 µg/L) were identified in samples collected from MW-2 at the former dry cleaners at 1205 East 7th Street. In AMU-7, PCE and trichloroethene (TCE) were reported at 87 and 1.3 µg/L, respectively. Concentrations have decreased with time in both the monitoring well and at AMU-7, but remain well above health-based benchmarks. The only active municipal well that contained any site-related contaminants was AMU-6, where PCE was reported at 3.6 µg/L. AMU-6 is approximately 950 feet northeast of AMU-7. PCE was reported at concentrations above the 1.6 µg/L cancer risk (CR) benchmark screening concentration from Superfund Chemical Data Matrix in samples from on-site monitoring well MW-2, the former municipal well AMU-7, and the active municipal well AMU-6. The MCL for PCE was exceeded in MW-2 and AMU-7. TCE concentrations detected in AMU-7 also exceeded the 0.21 µg/L CR benchmark screening level.

The removal reassessment in October 2012 focused primarily on characterization of the source area. The investigation consisted primarily of a membrane interface probe (MIP) assessment of soils, with confirmation sampling and analysis by the EPA Region 7 Laboratory. Geoprobe groundwater samples were also collected at 12 locations, as well as groundwater samples from three municipal wells and one city piezometer. Subsequent sampling activities by EPA and START personnel characterized sub-slab vapors and indoor air concentrations, further defined the extent of soil contamination, and developed a better understanding of the lithology at the source area. During the week of January 7, 2013, EPA collected sub-slab vapor samples at two locations under the Professional Services building west of the former drycleaners. On February 12, 2013, EPA collected additional sub-slab and crawl space samples, as well as indoor air samples at the Professional Services building and Rolling Hills Bank building. To further define the extent of soil contamination, START collected additional soil samples from 10 Geoprobe borings in March 2013. Also in March, one indoor air sample was collected. During the week of May 20, 2013, two deep soil borings were installed by use of rotosonic drilling techniques, and START collected groundwater samples from various intervals at each boring. The final mobilization occurred in June 2013, when START collected soil samples from three Geoprobe soil borings on the north side of East 7th Street (Tetra Tech 2013).

ENVIRONMENTAL SETTING

Sources of groundwater in the area of Cass County include alluvial valley aquifers, glacial-drift aquifers, and the Dakota Formation (U.S. Geological Survey [USGS] 1992). The alluvial aquifers are primarily made up of deposits along existing river valleys. The nearest alluvial valley to Atlantic is the east fork of the Nishnabotna River and its tributary, Troublesome Creek. The aquifer underlying the valley is relatively shallow, with an average depth of 21 feet, and is composed of fine-grained alluvial deposits. Thickness ranges from approximately 2 to 43 feet. Groundwater can also be obtained from shallow glacial-drift aquifers, consisting of glacial and loess deposits over bedrock. In the Atlantic area, these deposits range in thickness from 18 to 260 feet. Although the water table is usually shallow, production rates in the glacial-drift aquifers are often limited due to low soil permeability. Neither the alluvial nor the glacial drift aquifers are used for groundwater production in the Atlantic area.

The City of Atlantic draws its water solely from the Nishnabotna Member of the Dakota Formation. The Dakota is a fine- to coarse-grained sandstone, very poorly cemented (friable), partly pebbly to conglomeratic, and locally interbedded with seams of clay (IDNR 1996). Secondary lithologies include chert-quartz gravel, conglomerate, and gray to variegated mudstone with some siderite pellets. The formation is approximately 40 to 60 feet thick in the Atlantic wellhead protection area, providing abundant pore space for groundwater storage. Within the wellhead protection area, the Dakota is upwardly confined by clay-rich glacial till.

The aquifer is recharged by downward percolation through Pleistocene deposits and by lateral groundwater inflow from southwest Minnesota. Regional groundwater flow is from north to south, and natural discharge from the aquifer occurs into the lower reaches of major rivers in the region. Locally, groundwater flows from south to north (the direction of PCE migration), which results from a combination of topography and groundwater pumping from the municipal well field.

Measured static water levels (SWL) from past investigations are as follows: In monitoring wells MW-1 and MW-2, installed south of U.S. Highway 6 in the parking lots for the Burger King and former dry cleaners, SWL was 35.9 feet below top of casing (btoc) in MW-1 and 40.16 feet btoc in MW-2 in September 2002. In MW-3, approximately 450 feet north of MW-1, the SWL in September 2002 was 27.69 feet btoc. According to wells logs, the SWLs in MW-1 and MW-2 were in the Dakota Sandstone. In MW-3, the SWL was about 7 feet above the Dakota Sandstone in a fat clay. It is not clear if the groundwater occurred in the clay or if the Dakota water was under artesian pressure. When measured in

December 2011, as part of the site reassessment, the SWLs in the monitoring wells had risen between 4.22 feet in MW-3 to 5.18 feet in MW-2.

Closer to Troublesome Creek, SWLs are above the Dakota Sandstone. In the six borings installed as part of the 2005 hydrogeologic investigation, SWLs were reported at approximately 1,135 feet above mean sea level, or about 22 feet bgs. In this area, the saturated thickness of the alluvium above the Dakota sandstone was from 10 to 15 feet.

Average hydraulic characteristics of the Dakota Formation in the wellhead protection area are as follows (USGS 1992):

- Transmissivity = 1,750 to 3,075 square feet per day
- Hydraulic conductivity = 35 to 60 feet per day
- Hydraulic gradient = 0.003 feet per foot.

Below the Dakota is an aquiclude of impermeable, calcareous, gray-blue-red shales, with interbedded limestones, belonging to the Missourian Series of Pennsylvanian age. These shales are encountered at a depth of 85 to 90 feet bgs, and are approximately 725 feet thick in the Atlantic area.

SAMPLING STRATEGY AND METHODOLOGY

The sampling activities are tentatively scheduled to begin in late September 2014, and will require approximately 5 days to complete. One START member will be required to oversee drilling activities; two START members will be required to sample the monitoring wells once these are developed. START proposes to install three groundwater monitoring wells in accordance with the statement of work for drilling (see Appendix C). When applicable, the standard operating procedures (SOP) and chain-of-custody (COC) procedures referenced in the QAPP will be followed throughout the sampling activities to verify the integrity of the samples from the time of collection until submittal to the laboratory for analysis. Handling of investigation-derived wastes (IDW) is described below. Procedures for equipment and personal decontamination will be addressed in a site-specific health and safety plan prepared by Tetra Tech START. Most IDW is expected to consist of drill cuttings and development purge water generated from installation of monitoring wells, and disposable sampling supplies (gloves, paper towels, tubing, etc.) that will be disposed of off site as uncontaminated solid waste.

Pertinent data, including analyses to be performed and exact sample locations, will be recorded on field sheets for each sample. All samples will be stored in coolers maintained at temperatures at or below 4 degrees Celsius (°C) pending submittal to the EPA Region 7 laboratory.

Soil Sampling

During borehole advancement, the START geologist will collect a sample of the cuttings every 5 feet for visual observation and logging purposes. During advancement of the borings through the Dakota Sandstone, up to two samples will be collected of the bedrock material for total organic carbon analysis. It is anticipated that the material will be collected by use of a core barrel or split spoon sampler. Material will be transferred from the sampler into an 8-ounce jar and placed in an iced cooler.

Groundwater Sampling

Three newly installed monitoring wells and three existing monitoring wells will be sampled during assessment activities (see Appendix B, Figure 2). Groundwater from the monitoring wells will be sampled no sooner than 24 hours after development of the wells. The monitoring wells with be gauged with a water level indicator prior to sampling. The groundwater samples will be collected after purging a minimum of three borehole volumes of water from each monitoring well. Temperature, pH, specific conductivity, and turbidity shall be monitored and recorded during purging. Bailing or pumping shall continue until these parameters have stabilized (until a difference of less than 0.2 pH units and less than a 10 percent change in all other parameters is observed among three consecutive readings).

A field sheet will be completed for each groundwater sample location. The field sheets will include the following information: water quality parameters, purge times, estimated purge volumes, exact sample locations, property owner contact information, and analyses to be performed. The groundwater samples will be submitted to the EPA region 7 laboratory to be analyzed for VOCs. Water samples submitted for analysis for VOCs will be collected in four 40-milliliter vials and preserved with hydrochloric acid. All water samples will be stored in coolers maintained at or below a temperature of 4 °C pending submittal to the laboratory.

Quality Control Samples

To evaluate sample quality control (QC), a water trip blank and field blank will be collected during the sampling event, as specified in Section 2.5 of the QAPP form. Because evaluating total method precision is not necessary for this project, no field duplicates will be collected.

Investigation-derived Waste

Because all wells proposed are downgradient of the defined source area, there is no reason to believe that soils in the unconsolidated material above bedrock will be contaminated. Therefore, drill cuttings are not expected to be contaminated. At proposed monitoring wells PMW-1 and PMW-2, cuttings will be spread out near the wells. At proposed monitoring well PMW-3 in a residential setting, START will require all drill cuttings to be containerized in 55-gallon drums or roll-off bins for disposal at an off-site location.

Development/purge water will be containerized in either 55-gallon drums or a 500-gallon tank. Upon completion of well development, the containerized water will be disposed of to the sanitary sewer system.

ANALYTICAL METHODS

Water and soil samples will be submitted to the EPA Region 7 laboratory in Kansas City, Kansas, for analysis. The water samples will be analyzed for VOCs in accordance with SOPs and methods referenced in the QAPP. Soil samples collected from the Dakota Sandstone will be analyzed for total organic carbon. Standard turnaround times and detection limits for those methods will be adequate for this project. Appropriate containers and physical/chemical preservation techniques will be employed during the field activities to help verify that representative analytical results are obtained. An Analytical Services Request form will be completed by the Tetra Tech START Project Manager and submitted to the EPA Region 7 laboratory. Submittal of samples to the laboratory is expected in September 2014.

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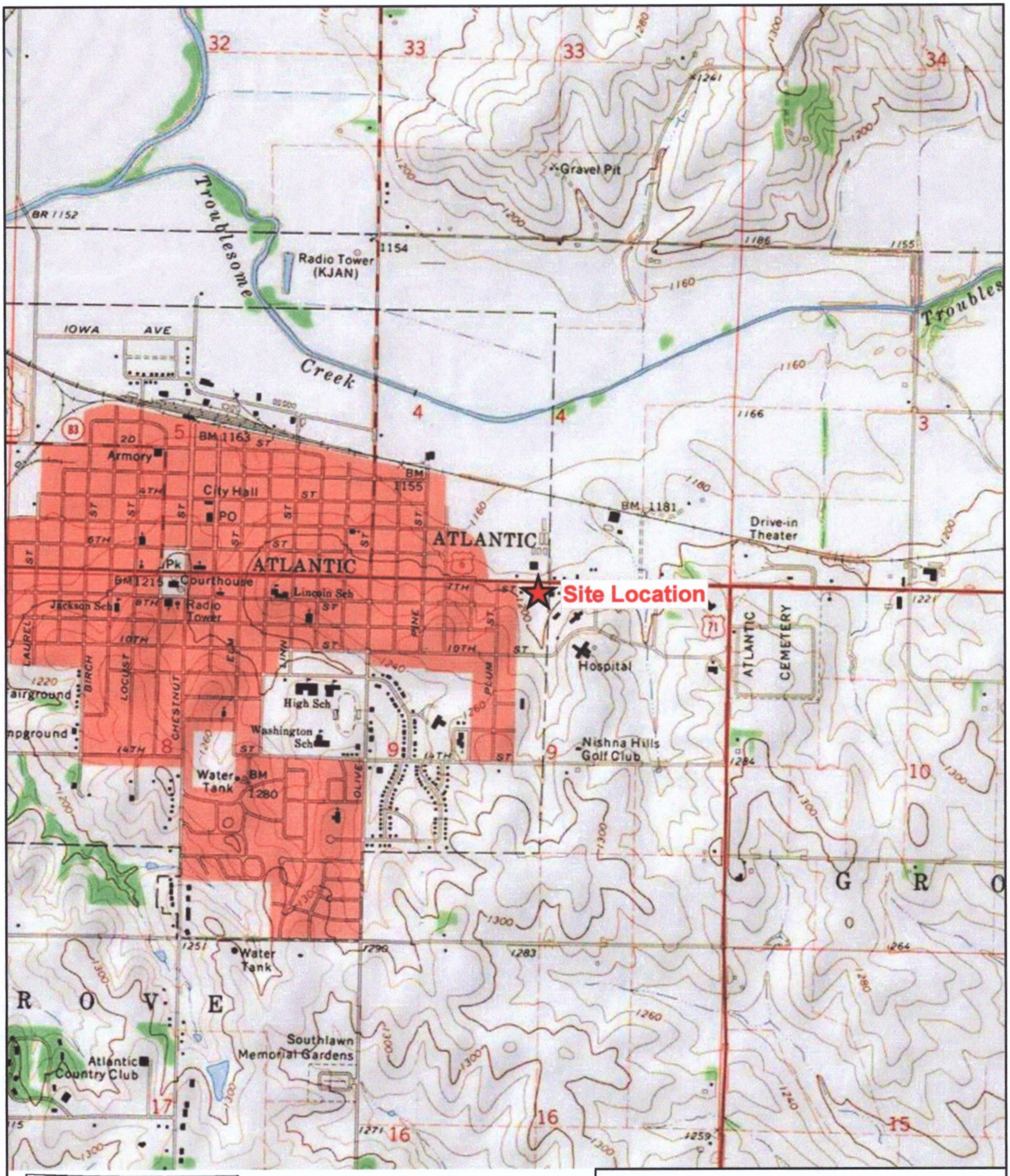
APPENDIX B

FIGURES



Source: USGS Atlantic, Iowa 7.5 Minute Topo Quad, 1991
USGS Wiota, Iowa 7.5 Minute Topo Quad, 1971

N

0 1,000 2,000
Feet

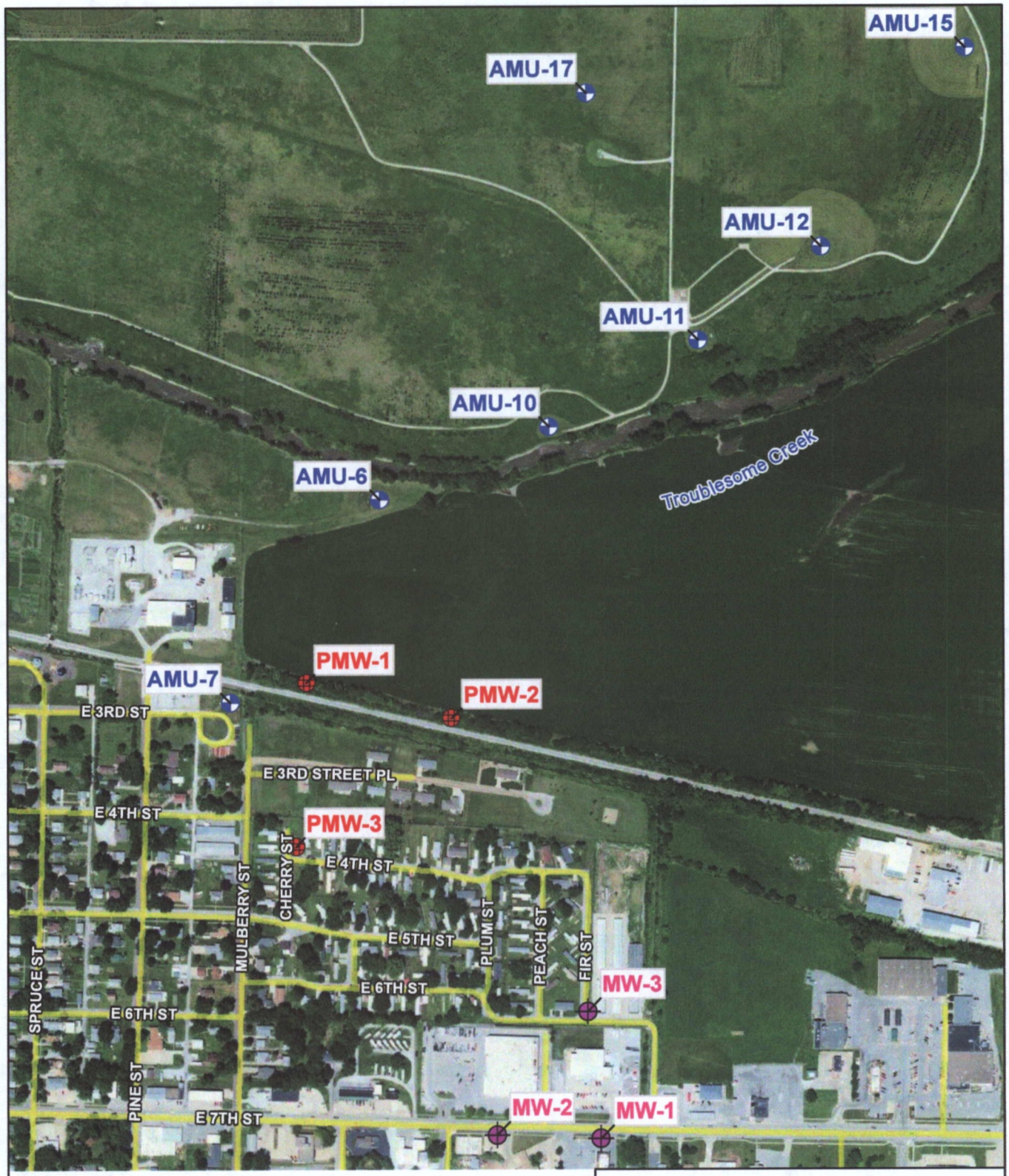
Atlantic Water Supply Site
Atlantic, Iowa

Figure 1
Site Location Map

TETRA TECH

Date: 2/20/2013 Drawn By: Bill Spiking Project No: X9004.L.12.0278.000

X:\G9004\0278000\Projects\mxd\Figure1.mxd



Legend

- Current monitoring well location
- Proposed monitoring well location
- Public water supply well location
- Street

N

0 250 500

Feet

Source: ESRI, Online Maps, World Imagery, 2013; HSIP Gold, 2007;

Atlantic Water Supply Site
Atlantic, Iowa

Figure 2
Proposed Monitoring Well Locations Map

TETRA TECH

Date: 8/20/2014 Drawn By: Clayton Hayes Project No: X9025140030.000

X:\G\902502500300\000\Projects\mxd\Figure2.mxd

APPENDIX C

STATEMENT OF WORK FOR WELL INSTALLATION, DEVELOPMENT, AND DRILLING SERVICES

STATEMENT OF WORK FOR WELL INSTALLATION, DEVELOPMENT AND DRILLING SERVICES AT THE ATLANTIC GROUNDWATER SITE ATLANTIC, CASS COUNTY, IOWA

August 14, 2014

Prime Contractor:	Tetra Tech, Inc.
Project Manager:	David Zimmermann, (816) 412-1788
Technical Contact:	Ted Faile, (816) 412-1754
Client:	U.S. Environmental Protection Agency
Site Name:	Atlantic Groundwater
Subcontractor Term:	8/29/14 through 9/26/14 (estimated)

1.0 INTRODUCTION

Tetra Tech was tasked by the U.S. Environmental Protection Agency (EPA) to conduct a Removal Assessment (RA) at the Atlantic Groundwater site. Atlantic, Iowa, is a rural community in northeastern Cass County, about 75 miles west of Des Moines, Iowa, and 45 miles northeast of Council Bluffs, Iowa. The apparent source of tetrachloroethylene (PCE) contamination at the Atlantic Water Supply site at 1205 East 7th Street (also known as U.S. Highway 6 and State Highway 83) is a former dry cleaning/Iowa Department of Transportation (IDOT) Materials Testing Laboratory facility that operated at this location during the 1960s. The objective of this part of the investigation is to better define the extent of contamination in the Dakota Sandstone formation such that predictive groundwater models can be verified and refined. This statement of work (SOW) specifies the work required of the drilling subcontractor in support of this investigation. Hollow stem Auger (HAS) drilling maybe used for overburden (about 30 feet) and wet rotary drilling techniques will be used to penetrate the Dakota Sandstone. It is anticipated that two to three monitoring wells will be installed and completed in the Dakota sandstone at depths of approximately 70 feet below grade. Drilling is expected to start about September 15, 2014, and is anticipated to last about a week. The price schedule requests unit costs for drilling and other activities. In order to provide the end client with the opportunity to request additional wells, Tetra Tech is also requesting comprehensive costs per well or boring, excluding mobilization and demobilization costs.

2.0 BACKGROUND

The site is in Atlantic, Cass County, Iowa, at 1205 East 7th Street. The approximate coordinates of the former dry cleaner are latitude 41.403718° north and longitude 94.995763° west.

Though the exact dates of operation are not known, the dry cleaning facility occupied the site in the 1960s and early 1970s. In 1974, the IDOT leased the site as a materials testing laboratory. Use of the site by IDOT continued until about 1986, when the IDOT relocated to a site east of the city. It is suspected that the dry cleaning operations and IDOT routinely used solvents. The building that housed the former dry cleaner and IDOT materials testing laboratory was razed between 1982 and 1994. The property is now owned by the Rolling Hills Bank and Trust.

Previous sampling of soil and groundwater at the former dry cleaning/materials testing laboratory location have documented PCE contamination in soil at concentrations as high as 3,400 milligrams per kilogram (mg/kg) and in groundwater at concentrations as high as 5,200 micrograms per liter (µg/L) or 5.2 mg/L.

Site Geology

The geologic stratigraphy in the vicinity of the site consists of Pleistocene sediments of alluvium, loess, and glacial drift deposits to an investigated depth (during the 2004 RSE) of 50 feet. Cretaceous Dakota Sandstone underlies the Pleistocene deposits, and Pennsylvanian-aged shale and limestone comprise the bedrock beneath the Dakota Sandstone. During the 2004 RSE, monitoring well boring MW-2 was advanced to a depth of 50 feet bgs within the source area. Soil samples were collected from boring MW-2 for geotechnical analysis of grain-size distribution. Most of the overburden consisted of silty clay that grades to a poorly graded sand beginning at an approximate depth of 36.5 feet bgs and continuing to total depth (50 feet bgs). However, geotechnical data for the sample collected at 46 feet bgs indicate a sandy silt (fine sand—12.9 percent [%]; medium sand—18%; and silt—66.6%). The change in lithology from poorly graded sand to sandy silt could not be logged due to poor recovery (10%) in the soil core from 40 to 45 feet bgs.

Site Hydrogeology

Sources of groundwater in the area of Cass County include alluvial valley aquifers, glacial-drift aquifers, and the Dakota Formation (U.S. Geological Survey [USGS] 1992). The alluvial aquifers are primarily made up of deposits along existing river valleys. The nearest alluvial valley to Atlantic is the east fork of the Nishnabotna River and its tributary, Troublesome Creek. The aquifer underlying the valley is relatively shallow, at an average depth of 21 feet, and is composed of fine-grained alluvial deposits. The thickness ranges from approximately 2 to 43 feet. Groundwater can also be obtained from shallow glacial-drift aquifers consisting of glacial and loess deposits over bedrock. In the Atlantic area, these deposits range in thickness from 18 to 260 feet. Although the water table is usually shallow, production

rates in the glacial-drift aquifers are often limited due to low soil permeability. Neither the alluvial nor the glacial drift aquifers are used for groundwater production in the Atlantic area.

The City of Atlantic draws its water solely from the Nishnabotna Member of the Dakota Formation. The Dakota is a fine- to coarse-grained sandstone, very poorly cemented (friable), part pebbly to conglomeratic, and locally interbedded with seams of clay (IDNR 1996). Secondary lithologies include chert-quartz gravel, conglomerate, and gray to variegated mudstone with some siderite pellets. At the former drycleaner, the Dakota formation is about 35 feet below grade. The formation is approximately 40 to 60 feet thick in the Atlantic wellhead protection area, providing abundant pore space for groundwater storage. In the wellhead protection area, the Dakota is upwardly confined by clay-rich glacial till.

Below the Dakota is an aquiclude of impermeable, calcareous, gray-blue-red shales, with interbedded limestones, belonging to the Missourian Series of Pennsylvanian age. These shales are encountered at 85 to 90 feet bgs (Lockheed Martin Technology Service 2005).

3.0 SCOPE OF SERVICES

The subcontractor shall furnish all supervision, labor, materials, tools, supplies, equipment, and services required to carry out the tasks described in this SOW. The subcontractor must be licensed to drill and install monitoring wells in the State of Iowa. The subcontractor is responsible for understanding State of Iowa monitoring well drilling and installation requirements before mobilizing to the site, and for complying with those requirements on site. The subcontractor is responsible for obtaining all permits as required by the State of Iowa and/or the City of Atlantic. The Subcontractor will also be responsible for obtaining utility clearances in the areas where the wells will be installed.

MONITORING WELLS

Quantity	Approximate Footage Per Well	Total Footage
3	70	210

3.1 Well Locations

The proposed monitoring well locations and soil boring locations are shown on Figure 1. The well locations shown on Figure 1 are approximate; actual locations will be determined by Tetra Tech personnel in the field.

In general, monitoring wells will be installed by drilling to the lower portion of the Dakota sandstone formation. Tetra Tech and EPA personnel in the field will determine the final depth of the well boring.

Once the well boring is complete, Tetra Tech and EPA personnel will then determine an appropriate screened interval for the well, based on visual observations of the continuous sample cores and previous groundwater sampling data. It is anticipated that the wells will be screened at depths ranging from 60 to 70 feet bgs.

The drilling methods must allow, or provisions must be made for, accurate determination of the depth to groundwater. Well borings shall be of sufficient diameter to permit at least 2 inches of annular space between the boring wall and the sides of the centered riser and screen. The boring diameter shall be of sufficient size to allow for the accurate placement and measurement of the screen, riser, filter pack, bentonite, and grout.

All sampling equipment shall be decontaminated according to the requirements stated in Section 3.8 of this SOW. All drill pipe, drilling tools, etc. shall be free of potentially contaminating materials (e.g., grease, oil, paint) and shall be steam cleaned prior to use at each monitoring well location. The drill rig shall be free of leaks that could contaminate the holes (e.g., hydraulic fluid, oil, gas, loose paint). No grease shall be used on drill pipe joints. Tetra Tech must approve the use of any lubricants.

3.3 Drilling Method

Overburden

The overburden thickness is expected to be approximately 30 feet, based on previous site assessments. Well borings shall be completed using a hollow-stem auger (HSA) method that will allow the accurate logging of the material using continuous coring equipment. Auger flights should be standard CME issue or equivalent, with a nominal inside diameter (ID) of 4.25 inches, and outside diameter (OD) of 6 to 8 inches. It may be necessary to alter drilling techniques should the desired depth be unattainable with HAS methods. Logging will be conducted using a CME 3.5-inch OD sampling system or equivalent, consisting of 5-foot split sampling tubes, with basket retainer and shoe. The Subcontractor shall provide at least two such samplers to avoid delays associated with decontamination. At each borehole location, Tetra Tech desires to collect one relatively undistrurbed sample from the Dakota sandstone for total organic carbon analysis. This can be with the 5-foot split sampling tubes or a 2-foot split spoon sampler.

Bedrock

Bedrock is expected to be encountered at a depth of about 30 feet bgs but may be deeper at some locations. Boreholes will be advanced into bedrock using mud-rotary drilling with a 6-inch-diameter tricone hammer bit. Each borehole will be advanced to a total depth of approximately 70 feet bgs.

3.4 Well Design and Installation

Monitoring wells will be constructed in accordance with the specifications outlined in the following sections.

3.4.1 Well Riser

Well risers for the monitoring wells shall consist of 2-inch diameter Schedule 40 PVC. Threaded joint couplings, to form watertight unions, shall join riser sections. Adhesives or solvents shall not be used to join the casing sections. The use of Teflon tape on threaded joints is acceptable and shall be noted on the well construction log. Each riser section shall be kept in its factory wrapping and off of the ground until it is installed in the borehole.

3.4.2 Well Screen

Well screens shall be constructed of the same size and strength material as the well risers with 0.010-inch slot size. Final screen length will be determined in the field by Tetra Tech or EPA but will likely be 10 feet in length. The bottom of the screen will be equipped with a one-foot PVC sump and end cap assembly. Field slotted screen is not permitted.

3.4.3 Well Completions

It is anticipated that wells PMW-1 and PMW-2 will be completed with above ground completions and that PMW-3 will be completed as a flush mounted completion as described below.

Protective Casing (above ground completion)

Each well shall be protected from entry of foreign materials at all times, and upon completion, each well shall be secured with a protective cover (provided by Subcontractor) installed around the well casing, which will be no more than 2.5 feet above grade. The annular space between the well and protective cover will be filled with sand to approximately 6 inches below the top of the well.

For the two wells proposed to be completed as aboveground completions, three concrete-filled protective bollards shall be placed around each well.

Protective Casing (flush mounted surface completion)

Each well shall be protected from entry of foreign materials at all times, and upon completion each well shall be secured with a protective structure such as a utility vault or meter box installed around the well casing which has been cut off below grade. This vault will be set into the cement surface before it cures, with the vault lid flush with the surrounding well pad or concrete sidewalk//parking lot. To ensure a watertight seal, use of expanding cement that bonds tightly to the vault is required. In addition, a flexible o-ring gasket will be installed between the vault and vault lid. Drainage will be directed away from wells completed in areas where significant runoff may occur.

Locks

The Subcontractor will provide a lock for each well. All locks will be keyed alike, and one duplicate key shall be provided to Tetra Tech with each lock.

Well Pad

It is anticipated that one of the wells will be installed along a City right-of-way, which may be a sidewalk, street, alley or maintained easement. In the event that a well is placed in a street or sidewalk, concrete will be placed around the upper portion of casing and the well vault will be finished to match the surrounding grade of the sidewalk or road.

Concrete pads will be required for any wells installed in unpaved areas. These pads will be a minimum of 4 feet by 4 feet square by 4 inches thick, and sloped away from the well with the top outer edge meeting ground level elevation.

Well Identification

The Subcontractor shall provide and securely affix a permanent corrosion-resistant tag to the well cap or to the inside of the well vault or vault lid. The tag will clearly identify the well number, depth, screened interval, and date of installation. The well shall also be clearly identified as a groundwater monitoring well.

3.4.4 Filter Pack

The annular space around the well screen shall be backfilled with clean, washed, well-rounded silica sand sized to perform as a filter between the formation material and the well screen. The filter pack material shall be tremied into place, or placed by other means approved by Tetra Tech, to avoid bridging and to insure a continuous filter pack throughout the screened interval of the well. The filter pack shall extend approximately 1 foot below and 2 to 4 feet above the well screen.

The grain size of the filter pack material is expected to be a 10-20 mesh sand.

3.4.5 Bentonite Seal

A minimum 3-foot thick bentonite seal shall be tremied or gravity fed into place in the annular space above the well screen and filter pack sand. The seal shall be composed of commercially manufactured sodium bentonite pellets or granules. Bentonite pellets shall not exceed one-half inch diameter. The bentonite pellet seal shall be allowed to hydrate a minimum of 2 hours before grouting begins. If the bentonite seal is positioned above the water table, granular bentonite shall be installed in 1-foot lifts with each lift hydrated a minimum of 20 minutes before the next lift is placed. Clean, potable water shall be added to hydrate the bentonite. After the placement of the final lift, the granular bentonite seal shall be allowed to hydrate an additional 2 hours before grouting begins.

3.4.6 Annular Seal

Cement grout shall be placed above the bentonite seal to the ground surface. The cement grout shall consist of a mixture of Portland cement (ASTM C 150) and water in the proportion of not more than 7 gallons of approved water per bag of cement (94 pounds). Additionally, 3 percent by weight of sodium bentonite powder shall be added unless prohibited by state or local regulations. Grout shall be placed by pumping through a side-discharging tremie pipe with the lower end of the tremie pipe located within 3 feet of the top of the bentonite seal. Pumping shall continue until undiluted grout flows from the boring at the ground surface.

3.4.7 Temporary Capping

Any well that is to be temporarily removed from service or left incomplete due to delays in construction shall be capped with a watertight cap and equipped with a "vandal proof" cover that satisfies applicable state or local regulations.

3.5 Well Development

Within 1 week after each well has been constructed, but no sooner than 24 hours after grouting is completed, well development will be completed without the use of dispersing agents or acids. The objectives of well development are to: (a) assure that groundwater enters the well screen freely, thus yielding a representative groundwater sample and an accurate water level measurement, (b) remove all water that may have been introduced during drilling and well installation, (c) remove very fine-grained sediment in the filter pack and nearby formation so that groundwater samples are not highly turbid and silting of the well does not occur.

Development shall consist of mechanical surging (with a surge block) and bailing for a minimum of 2 hours. Sediment that enters the well during this process shall be removed by periodic bailing or pumping. At the end of that time, the well shall be continuously pumped for a minimum of 15 minutes using an electric submersible pump. Temperature, pH, specific conductivity and turbidity shall be monitored by Tetra Tech during pumping. Pumping shall continue until these parameters have stabilized (less than 0.2 pH units or a 10 percent change for all other parameters between three consecutive readings), and the water is clear and free of fines.

3.6 Standby Time

The Subcontractor will be paid for downtime incurred at the request of Tetra Tech only. Such downtime will be paid at the rate for "Standby" time as per the Subcontractor's bid. Downtime resulting from the Subcontractor's equipment, personnel, or otherwise will not be considered standby time. Downtime resulting from "Acts of God/Nature" will not be considered standby time. A record of all standby time, indicating the quantity and nature, must be submitted to the Tetra Tech site manager on the day in which it was incurred.

3.7 Well Acceptance Criteria

The specifications prepared for this subcontract attempt to minimize the problems that would result in an unacceptable well. Acceptability of a well is based on its ability to meet its intended use. General well acceptability criteria are given below:

All risers shall be set round, plumb, and true to line. A 10-foot long section of pipe, with a diameter one-half inch less than the inner diameter of the well casing, shall be run through the entire length of the well to check alignment. If the pipe does not pass freely for the entire depth of the well, the Subcontractor

shall replace or repair the well at no additional cost to Tetra Tech if so directed by the Tetra Tech site manager.

The Subcontractor shall develop the wells until, in the opinion of Tetra Tech, they meet the following conditions:

Producing water substantially free of sand or silt;

Producing water completely free of drilling fluids;

Producing water with stabilized field parameters.

All casing, screens, grout, bentonite seals, and filter packs shall be set to the depths directed by Tetra Tech (Tetra Tech will verify all field measurements).

Any well that shows evidence of grout contamination, as indicated by initial high pH readings during development, or by production of cementaceous material, will not be acceptable.

If a monitoring well is disapproved by EPA or Tetra Tech, the well shall be abandoned in accordance with Chapter 567-39, Iowa Administrative Code (IAC). Such work shall be done at no additional cost to Tetra Tech.

Failure of a well to meet the acceptance criteria will constitute cause to cancel any and all payments that would otherwise be paid in connection with the installation and completion of the well in question.

3.8 Decontamination Procedures

All drilling equipment, surface and downhole, including drill pipe and drive casing, tanks, etc. shall be steam-cleaned onsite prior to first use, between mobilization to each new borehole, and prior to leaving the site after the final well is installed. The drill rig shall be decontaminated after completion of drilling, or as needed, per the discretion of the Tetra Tech site manager.

Core barrels and other sample-contact equipment will be decontaminated by steam cleaning or by a double-wash in alconox/tap water solution followed by a tap water rinse.

The Subcontractor shall construct a temporary decontamination facility at the site. This facility will be capable of containing all fluids produced during decontamination and steam cleaning of drilling and sampling equipment. Upon completion of decontamination activities, or on a periodic basis as necessary,

decontamination fluids shall be pumped from the temporary containment into portable tanks or drums and transported to a centrally located area designated by the Tetra Tech site manager.

3.9 Investigation Derived Wastes

The Subcontractor shall be responsible for containerizing drill cuttings, development water and decontamination fluids generated during the well installation/development activities. Drill cuttings, development water and decontamination fluids shall be containerized in new, 55-gallon DOT-approved drums (DOT type 17H), to be provided by the Subcontractor. The Subcontractor shall also be responsible for transporting drums containing IDW to a centrally located area designated by the Tetra Tech site manager. These drums will be stacked on pallets, to be provided by the Subcontractor.

3.10 Submittals

The Subcontractor shall furnish one copy of their license to drill in the State of Iowa to Tetra Tech prior to mobilizing to the site.

The Subcontractor shall furnish the source and location of a potable water supply, written authorization of the supplier, and the method of transporting and containing the potable water. Upon request, Tetra Tech may require a sample of the potable water for chemical analysis prior to or during the drilling activities.

The Subcontractor shall supply training records, medical certificates, and fit test certification for each Subcontractor employee assigned to the project. The Subcontractor shall provide documentation of current (within last year) industrial medical physicals for all drilling and support personnel. Additional documentation indicating Subcontractor personnel have completed the OSHA regulation 29 CFR 1910.120 40-hour health and safety course, annual 8-hour refresher course, and fit test certificates will also be required. Documentation shall be provided at least 5 days before mobilization to the site. Work will not begin until these documents have been received by Tetra Tech.

The Subcontractor shall supply rig inspection certificates prior to the start of field activities.

The Subcontractor shall prepare and submit any and requests, registration forms, notices, well logs, or other information as required by Iowa State law.

The Subcontractor shall prepare a site-specific health and safety plan (HASP) that meets the requirements specified in Section 4.1 of this SOW.

3.11 Electricity and Water

The Subcontractor shall provide, at their own cost, all electric power required for well construction, testing, and other purposes through temporary or permanent facilities. If electric power is to be obtained from a local utility, the Subcontractor shall arrange with the local utility to provide adequate temporary electrical service at a mutually agreeable location. The Subcontractor shall then provide adequate job site distribution facilities conforming to applicable codes and safety regulations.

The Subcontractor shall provide and convey to the drilling sites and decontamination area, all water required for borehole drilling, monitoring well construction, and decontamination.

3.12 Site Ingress, Site Egress, and Utility Notification

Tetra Tech and EPA shall provide rights of ingress and egress. The Subcontractor shall be responsible for any clearing or construction of any physical access that is required to move equipment to the well site.

The Subcontractor will also be responsible for obtaining utility clearances where the wells will be installed.

3.13 Traffic Control

It should be noted that one of the wells may be located along City streets, in private parking lots and on private property. Therefore, some traffic or pedestrian control measures may need to be implemented to allow the drilling crew to operate safely. The Subcontractor shall be responsible for providing all equipment (cones, barricades, etc.) necessary to implement such measures, as required.

3.14 Site Restoration

The Subcontractor shall be responsible for preserving, protecting, and preventing damage to all public and private property. Any damage to private or public property resulting directly or indirectly from any of the Subcontractor's operations shall be restored in a manner acceptable to Tetra Tech, at the Subcontractor's expense, to a condition similar or equal to that existing before the damage was done.

3.15 Mobilization/Schedule

Drilling is scheduled to begin on or about September 15, 2014. Mobilization must take place prior to this date. It is anticipated that this work will be completed prior to the weekend of September 19, 2014; however, the Subcontractor shall be prepared to work one or both of these days, if required.

4.0 HEALTH AND SAFETY REQUIREMENTS

The Subcontractor shall maintain and implement a health and safety program pursuant to the OSHA general industry standards and construction industry standards.

4.1 Health and Safety Plan

The Subcontractor shall prepare and submit to Tetra Tech a site-specific HASP. At a minimum, the HASP shall conform to the following requirements:

"Hazardous Waste Operations and Emergency Response" Title 29, Code of Federal Regulations, Section 1910.120 (b)(4) (Office of the Federal Register 1998)

"Safety and Health Requirements" EM 385-1-1 (USACE 1996)

4.2 Special Health and Safety Requirements

In addition to the standard requirements of a HASP, the Subcontractor shall comply with the following:

First Aid: The Subcontractor shall provide one person per work crew that is current in standard industrial first aid and cardiopulmonary resuscitation (CPR) (American Red Cross or U.S. Bureau of Mines standard).

Safety Equipment: The Subcontractor shall provide one fire extinguisher (15 lb. or 3A:40BC) per vehicle per work crew.

Site-Specific Training: The Subcontractor shall make employees available for a project kickoff meeting, in the event that such a meeting is held onsite. The Subcontractor shall provide an equivalent orientation to replacement workers after the kickoff meeting.

Equipment Inspections: The Subcontractor shall provide certification of inspection and safe operating condition for each heavy vehicle (gross vehicle weight greater than 8,000 pounds) prior to beginning work. The Subcontractor shall also maintain written documentation of regular inspection of all equipment and vehicles in accordance with manufacturer's recommendations, industry standards, the Subcontractor's written program, or the Subcontractor's health and safety program.

4.3 Personal Protective Equipment Requirements

The Subcontractor shall perform fieldwork using Level D personal protective equipment (PPE). In the event that site specific conditions mandate a change, as directed by the Tetra Tech site manager, the Subcontractor must be prepared to upgrade to modified Level D or Level C. Fieldwork will not be conducted in Levels A or B. The following are the minimum requirements for each PPE level:

Level Personal Protective Equipment

D Hard hat; American National Standards Institute (ANSI) approved safety glasses; steel toe and shank leather work boot; long pants; sleeved shirt

D Modified Level D PPE and chemical protective (CP) Tyvek, polyethylene coated Tyvek, or Saranex coveralls; CP gloves (nitrile, neoprene, or viton); and CP over boots

C Level D Modified PPE and full face air purifying respirator with combination high-efficiency particulate and organic vapor cartridge

APPENDIX A

BID SCHEDULE

PRICE SCHEDULE

Atlantic Water Supply

Item No.	Description	Est. Quantity	Unit	Unit Price	Total
1	Mobilization/Demobilization*	1	Lump Sum	$ -	$ -
2	HAS / Wet rotary drilling (four wells at approximately 70 feet per well)	210 (maximum)	Ft.	$ -	$ -
3	2" PVC well construction (labor and materials)	210 (maximum)	Ft.	$ -	$ -
4	Decontamination facility (labor and materials, including steam cleaner)	1	Lump Sum	$ -	$ -
5	Decontamination between well and boring locations	3	Well/ Soil Borings	$ -	$ -
6	Well completion (concrete pads, protective casing, locks, 6 bollards, ID tags)	1	Well	$ -	$ -
7	Well development (including containers for development water)	3	Well	$ -	$ -
8	Containerize and transport IDW for wells (including pallets and containers)	3 (maximum)	Well	$ -	$ -
9	Containerize and transport IDW for soil borings wells (including pallets and containers)	3 (maximum)	Soil Boring	$ -	$ -
10	Standby time (as defined in Section 4.5 of SOW)		Hr.	$ -	$ -
	TOTAL				$ -

*** Item 1 includes all costs associated with the movement of personnel and equipment required for the performance of entire project.**
All other work to be performed by the Contractor is considered incidental to bid items listed in this table and will not be paid for separately.

Estimated total cost per well (including all costs except mobilization/demobilization): _____

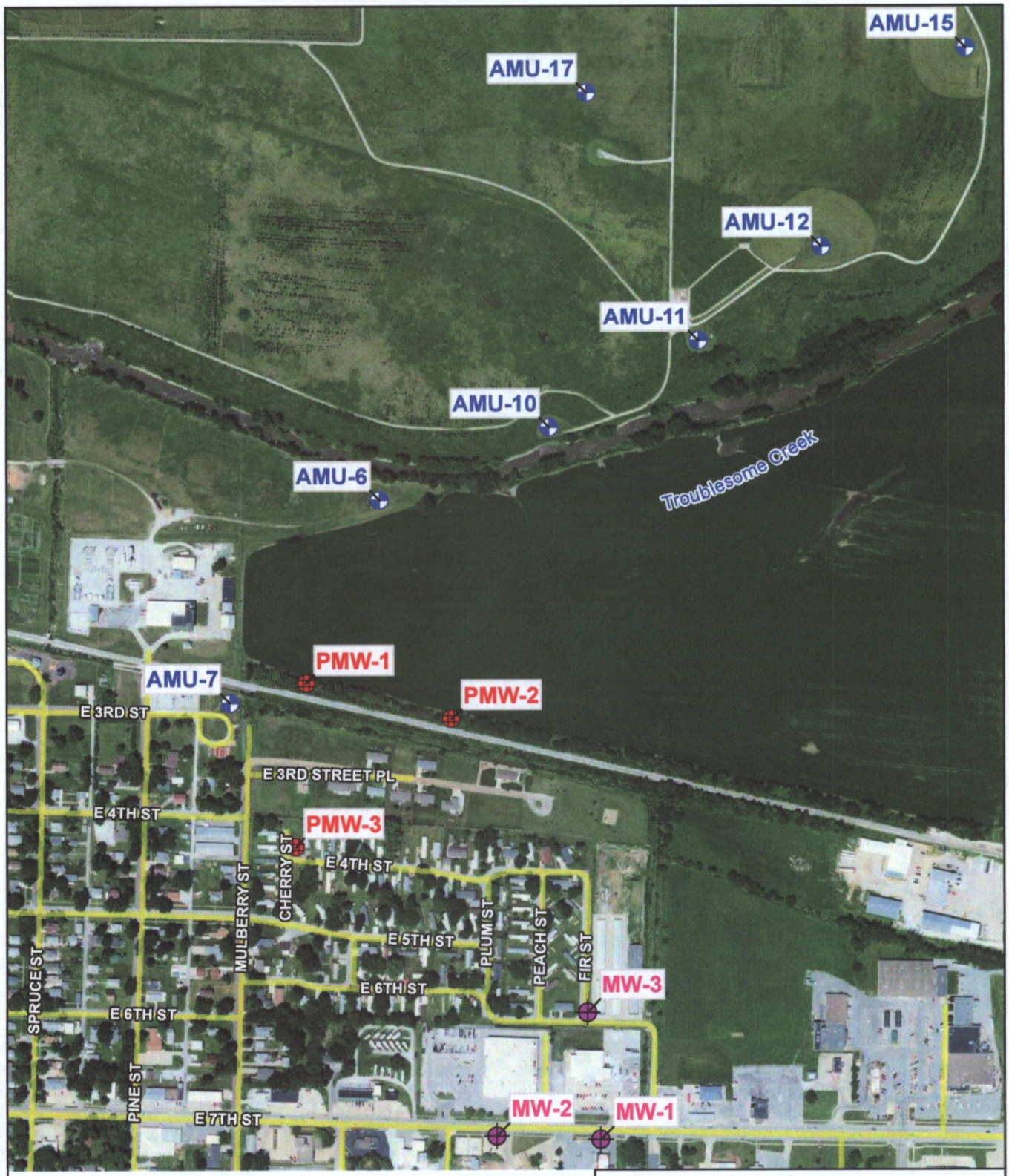
Estimated total cost per boring (including all costs except mobilization/demobilization): _____

Subcontractor: _____

Representative / Date: _____

APPENDIX B

FIGURE



Legend

- Current monitoring well location
- Proposed monitoring well location
- Public water supply well location
- Street

N

0 250 500

Feet

Source: ESRI, Online Maps, World Imagery, 2013; HSIP Gold, 2007;

Atlantic Water Supply Site
Atlantic, Iowa

Figure 1
Proposed Monitoring Well Locations Map

TETRA TECH

Date: 7/29/2014 Drawn By: Clayton Hayes Project No: X9025140030.000

X:\G\902500300\000\Projects\mxd\Figure1.mxd

CONSENT TO ACCESS FOR ENVIRONMENTAL RESPONSE ACTION

Property Owner(s): City ROW

Property Address: 1000 3rd St Place
Atlantic, IA

Right of Entry. I am the owner, representative of the owner, or lessee of the property described above. I hereby consent to the United States Environmental Protection Agency (EPA) and its authorized employees, contractors, and agents to enter, investigate, install observation wells, and/or sample the described property, and conduct activities to respond to the release or threat of release of hazardous substances, pollutants, or contaminants at, on, and/or from, the property, in accordance with Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9604.

Purpose and Scope of Environmental Response Action. EPA desires to perform certain actions, consistent with the National Contingency Plan (NCP), in responding to a release or threat of releases of hazardous substance(s) at the Atlantic Water Supply (Site) within the City of Atlantic, Cass County, State of Iowa. The groundwater in the vicinity of the Site has been contaminated by such releases and the response action is intended to address such releases of to protect human health and the environment. The environmental response actions to be performed on the Property shall include one or more of the following activities:

- Installation of observation well(s) utilizing a drilling rig
- Periodic sampling of observation well(s)

Installation and sampling of the observation well(s) will require the EPA, its employees and authorized contractor representatives to enter the property. The EPA will provide advanced notice before installation of observation well(s).

Release of Sampling Data. In accordance with Section 104(e)(7) of CERCLA, I consent to EPA releasing to the public all analytical results of any samples that EPA collects on my property, as identified by the property address. EPA will provide the results of the analysis of all samples taken on the property which is the subject of this Agreement to the person duly authorized to provide access.

Restoration of Property. I recognize that the performance of such actions may require some disturbance of the property and that EPA will attempt to minimize such disturbance, and that areas of disturbance will be restored as nearly as possible to prior condition by EPA, subject to the availability of appropriated funds.

Liability. I understand that EPA requires its contractors to maintain comprehensive vehicle liability insurance, and comprehensive general liability insurance for bodily injury, death, and loss or damage to property or third persons arising from their activities. I also understand that EPA's liability for damages to the property or injuries to persons which result from or are caused by its activities on the property shall be to the extent permitted by the Federal Tort Claims Act (28 U.S.C. §§ 1346(b), 2671 - 2680) and the Federal Employee's Compensation Act (5 U.S.C. §§ 8101 - 8151).

Term. The consent granted hereby will terminate upon EPA's notifying the Grantor that the environmental investigation/response is complete or receipt by EPA, of written notice from Grantor that consent to access has been withdrawn, provided that reasonable time is allowed for proper cessation of activities on the property.

This written permission is given by me voluntarily and without threats or promises of any kind. By my signature I acknowledge that I am authorized to grant the access provided for herein.

CONSENT TO ACCESS FOR
ENVIRONMENTAL RESPONSE ACTION

Sept 19, 2014
Date

John D. Harris
Signature

John D. Harris
Printed Name

City Administrator
Title

012213dah